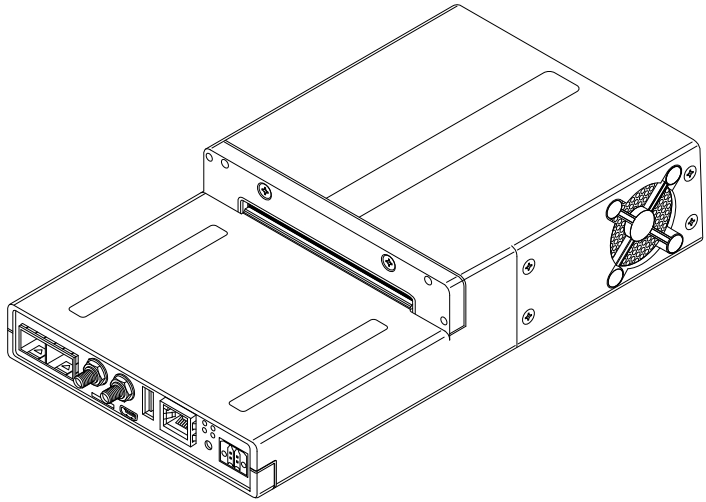
GETTING STARTED GUIDE

NI-7935R

Controller for FlexRIO™

This document describes how to begin using the NI-7935R.

Figure 1. NI-7935R



Related Information

For information about the device specifications, refer to the NI-7935R Specifications at ni.com/manuals.

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FlexRIO Documentation

Table 1. FlexRIO Documentation Locations and Descriptions

Document	Location	Description
Getting started guide for your controller for FlexRIO	Available from the Start menu and at *ni.com/manuals*.	Contains installation instructions for your FlexRIO system.
Specifications document for your controller for FlexRIO	Available from the Start menu and at *ni.com/manuals*.	Contains specifications for your controller for FlexRIO.
Getting started guide for your adapter module	Available from the Start menu and at *ni.com/manuals*.	Contains signal information, examples, and CLIP details for your adapter module.
Specifications document for your adapter module	Available from the Start menu and at *ni.com/manuals*.	Contains specifications for your adapter module.
LabVIEW FPGA Module Help	Embedded in *LabVIEW Help* and at *ni.com/manuals*.	Contains information about the basic functionality of the LabVIEW FPGA Module.

Table 1. FlexRIO Documentation Locations and Descriptions (Continued)

Document	Location	Description
Real-Time Module Help	Embedded in *LabVIEW Help* and at *ni.com/manuals*.	Contains information about real-time programming concepts, step-by-step instructions for using LabVIEW with the Real-Time Module, reference information about Real-Time Module VIs and functions, and information about LabVIEW features on real-time operating systems.
FlexRIO Help	Available from the Start menu and at *ni.com/manuals*.	Contains information about the FPGA module front panel connectors and I/O, controller for FlexRIO front panel connectors and I/O, programming instructions, and adapter module component-level IP (CLIP).
FlexRIO Adapter Module Development Kit User Manual	Available from the Start menu at **Start»All Programs»National Instruments»NI FlexRIO»NI FlexRIO Adapter Module Development Kit» Documentation**.	Contains information about how to create custom adapter modules for use with FlexRIO FPGA modules.
LabVIEW Examples	Available in NI Example Finder. In LabVIEW, click **Help»Find Examples»Hardware Input and Output»FlexRIO**.	Contains examples of how to run FPGA VIs and Host VIs on your device.
IPNet	Located at *ni.com/ipnet*.	Contains LabVIEW FPGA functions and intellectual property to share.
FlexRIO product page	Located at *ni.com/flexrio*.	Contains product information and data sheets for FlexRIO devices.

Related Information

Programming with LabVIEW on page 12

Safety Guidelines

Caution You can impair the protection provided by the NI-7935R if you use it in a manner not described in this document.

Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. These requirements and limits provide reasonable protection against harmful interference when the product is operated in the intended operational electromagnetic environment.

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.

Caution To ensure the specified EMC performance, operate this product only with shielded cables and accessories. The DC power input cables and optical SFP+ cables may be unshielded.

Caution To ensure the specified EMC performance, you must use an isolated cable with the SFP+ ports.

Caution To ensure the specified EMC performance, the length of any cable connected to the TRIG ports and REF CLK ports must be no longer than 3 m (10 ft). The length of copper cables connected to the SFP+ ports must be no longer than 3 m (10 ft). The length of cables connected to the USB device ports or host ports must be no longer than 30 m (100 ft). The lengths of Ethernet cables and optical SFP+ cables are not limited.

Caution The USB device port is intended only for use in device configuration, application deployment, debug, and maintenance.

Verifying the System Requirements

To use the NI-7935R, your system must meet certain requirements. For more information about minimum system requirements, recommended system, and supported application development environments (ADEs), refer to the readme, which is available on the software media or online at *ni.com/updates*.

What You Need to Get Started

- The NI-7935R shipping kit, which includes the following components:
  - The NI-7935R device
  - FlexRIO Support DVD

    Note FlexRIO Support 15.1 is the earliest supported driver for the NI-7935R.
  - *NI-7935R Getting Started Guide* (this document)
  - Power screw terminal connector plug
  - A to Mini-B device port USB cable
- A host computer running Windows, with NI software installed in the following order:

  Note Visit *ni.com/info* and enter the Info Code `rdsoftwareversion` to determine which software versions you need to use the NI-7935R and supported FlexRIO adapter modules.
  - LabVIEW
  - LabVIEW Real-Time
  - LabVIEW FPGA
  - FlexRIO Support[1]
- A DC power supply as described in the *NI-7935R Specifications*
- A FlexRIO adapter module or custom adapter module (optional)
- A number 2 Phillips screwdriver
- A number 1 Phillips screwdriver
- A small flat-blade screwdriver
- Straight through shielded Ethernet cable (if connecting to a network) or crossover shielded Ethernet cable (if connecting directly to a PC)

Unpacking the Kit

Caution To prevent electrostatic discharge (ESD) from damaging the device, ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis.

1. Touch the antistatic package to a metal part of the computer chassis.
2. Remove the device from the package and inspect the device for loose components or any other sign of damage.

   Caution Never touch the exposed pins of connectors.

[1] LabVIEW 2015, FlexRIO Support 2015, LabVIEW Real-Time 2015, and LabVIEW FPGA 2015 are the earliest versions of software that support the NI-7935R.

Note Do not install a device if it appears damaged in any way.

3. Unpack any other items and documentation from the kit.

Store the device in the antistatic package when the device is not in use.

Preparing the Environment

Ensure that the environment you are using the NI-7935R in meets the following specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	0 °C to 55 °C
Operating humidity (IEC 60068-2-56)	10% to 90% RH, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m at 25 °C ambient temperature

Indoor use only.

Note Refer to the *NI-7935R Specifications* at *ni.com/manuals* for complete specifications.

Caution Clean the hardware with a soft, nonmetallic brush. Make sure that the hardware is completely dry and free from contaminants before returning it to service.

Wiring Power to the NI-7935R

The NI-7935R requires a 9 V to 30 V external power supply that meets the specifications in the *NI-7935R Specifications*. The NI-7935R filters and regulates the supplied power and provides power for the I/O modules.

Note You can latch the power plug to the NI-7935R using two screws tightened to 0.20 to 0.25 N · m (1.8 to 2.2 lb · in.) of torque.

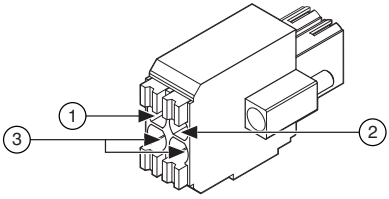
The maximum wire gage accepted by the power connector plug is 16 AWG. You must use a stripped wire length of 10 mm (.394 in).

When the POWER LED on the front panel is lit green, the device is powered.

The NI-7935R has reverse-voltage protection.

Complete the following steps to connect a power supply to the NI-7935R.

1. Ensure the power source is turned off.
2. Connect a positive wire to the positive terminal of the power connector plug, and connect a negative wire to the negative terminal of the power connector plug.



1. Positive terminal
2. Negative terminal
3. No connect

3. Install the power connector on the front panel of the NI-7935R.
4. Turn on the external power source(s).

Powering on the NI-7935R

When you apply power for the first time to the NI-7935R, the controller boots into safe mode. The POWER LED illuminates, the STATUS LED illuminates briefly, and then the STATUS LED blinks twice every few seconds.

After you install software on the controller, subsequent reboots will boot the controller into the NI Linux Real-Time operating system.

You can optionally configure the NI-7935R to launch an embedded stand-alone LabVIEW Real-Time application each time you boot the controller.

STATUS LED

The STATUS LED is off during normal operation. The NI-7935R indicates specific error conditions by flashing the STATUS LED a certain number of times every few seconds, as shown in the following table.

LED State	Indication
2 flashes every few seconds	There is no software installed, which is the out-of-box state, or the controller has detected an error in its software. An error can occur when an attempt to upgrade the software is interrupted. Refer to the *MAX Help* for information about reinstalling software on the controller.
3 flashes every few seconds	The controller is in safe mode. Refer to the *MAX Help* for information about safe mode.

LED State	Indication
4 flashes every few seconds	The software has crashed twice without rebooting or cycling power between crashes. This usually occurs when the controller runs out of memory. Review your Real-Time VI and check the memory usage. Modify the VI as necessary to solve the memory usage issue.
Continuously flashing	The controller has not booted into NI Linux Real-Time. The controller either booted into an unsupported operating system, was interrupted during the boot process, or detected an unrecoverable software error.
Solid	The controller is booting up.
Continuously flashing	This indicates a hardware error. An internal power supply has failed. Check front-panel I/O and adapter module connections for shorts. Remove any shorts and power cycle the controller. If the problem persists, contact National Instruments.
Off	Normal operation.

Connecting the NI-7935R to the Host Computer

Complete the following steps to connect the NI-7935R to the host computer using the USB device port.

1. Power on the host computer.
2. Connect the NI-7935R to the host computer using the USB A-to-B cable.

Note Alternatively, you can use the RJ-45 Ethernet port to connect the NI-7935R to the host computer.

The device driver software automatically detects the NI-7935R. If the device driver software does not detect the NI-7935R, verify that you installed the appropriate NI software in the correct order on the host computer.

Tip You can also use the Ethernet port to connect directly to the host computer or network. Refer to the user manual on *ni.com/manuals* for more information about Ethernet connections.

Related Information

Troubleshooting the NI-7935R on page 12

Installing the FlexRIO Adapter Module

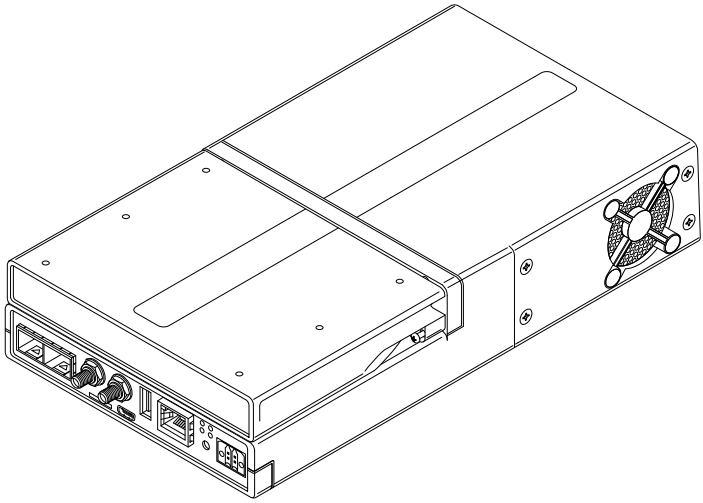
Skip this section if you are not using a FlexRIO adapter module.

1. Gently insert the guide pins and the high-density card edge of the FlexRIO adapter module into the corresponding connectors of the NI-7935R.

   The connection may be tight, but do not force the adapter module into place.
2. Tighten the captive screws on the FlexRIO adapter module to secure it to the NI-7935R.

The following figure shows the NI-7935R with the FlexRIO adapter module connected.

Figure 2. NI-7935R with FlexRIO Adapter Module



Refer to the getting started guide for your adapter module for more information about your adapter module, including programming information.

Configuring the System in Measurement & Automation Explorer (MAX)

After connecting the NI-7935R to the host computer, complete the following steps to configure the system for the first time in MAX.

1. Launch MAX on the host computer.
2. Expand **Remote Systems** in the MAX configuration tree and select the system. MAX lists the system as the model name followed by the serial number, such as NI-7935R-030521C9.

Related Information

Why Doesn't the Device Appear in MAX? on page 13

Setting a System Password

Complete the following steps to set a system password.

Note Setting a system password is optional.

Note The default username for the NI-7935R is `admin`. There is no default password for the NI-7935R, so you must leave the password field blank when logging in until you set a system password.

1. Right-click your system and select **Web Configuration**.

   The NI Web-based Configuration and Monitoring utility opens in your default browser and is where you set the password. If you have not installed Microsoft Silverlight, NI Web-based Configuration & Monitoring prompts you to do so.
2. Enter a unique name for your system in the **Hostname** field.
3. Click the **Security Configuration** icon.
4. Click **Login**.
5. In the **Login** dialog box, enter the username `admin` and leave the password field blank.
6. Click **OK**.
7. Click **Change Password**.
8. Enter and re-enter a new password.
9. Click **OK**.
10. Click **Save**.
11. Click **OK** to confirm you are changing the password.

Caution NI cannot recover lost system passwords. If you forget the password, you must contact NI and reformat the controller.

Installing Software on the NI-7935R

1. Open Measurement & Automation Explorer (MAX).
2. Expand the system under **Remote Systems** by clicking the arrow beside it.
3. Select **Software**.
4. Click **Add/Remove Software** at the top of the **Software** tab to launch the LabVIEW Real-Time Software Wizard.

   Note A login window appears if you set a system password.
5. Select a recommended software set to install.
6. Click **Next**.

7. The recommended software set is preselected from the list of software add-ons. Check any additional software add-ons you want. The System State Publisher, for example, makes monitoring system performance simple.

   Note You can use the LabVIEW Real-Time Software Wizard to install more software add-ons later. The FlexRIO 15.0 Recommended Software Set is enough to get started.

8. Click **Next**.
9. Review the summary of software to install. Click **Next** to begin the update.
10. Wait for the installation to finish, and then click **Finish**.

Adding the NI-7935R to a LabVIEW Project

1. Launch LabVIEW. The LabVIEW **Getting Started** window appears.
2. Click **Create Project** or open an existing project.
3. Right-click the project root in the **Project Explorer** window and select **New»Targets and Devices** from the shortcut menu to display the **Add Targets and Devices** dialog box.
   a) If the hardware is connected to the host, select **Existing target or device**. Select the NI-7935R under **Real-Time FlexRIO** and click **OK**.
   b) If the hardware is not connected to the host, select **New target or device**. Select the NI-7935R under **Real-Time FlexRIO** and click **OK**.
4. Right-click the target and select **New»FPGA Target**.

   The FPGA target appears in the project under the Real-Time target.

Adding a FlexRIO Adapter Module to the Target

Skip this section if you are not using an adapter module.

1. Expand the FPGA target by clicking the + button, then right-click **IO Module** and select **Properties**.
2. Select the **General** category and check the **Enable IO Module** box.
3. Select your I/O module from the **IO Modules** list, and select the CLIP you want to use from the **Component Level IP** box.
4. Click **OK**.

Programming Options

Refer to the following table for information about how to program the NI-7935R.

Component	Programming Option(s)
Real-Time controller	LabVIEW Real-Time or C/C++ Development Tools for NI Linux Real-Time, Eclipse Edition.
FPGA	LabVIEW FPGA

Programming with LabVIEW

The Controller for FlexRIO examples provide a starting point for programming with LabVIEW. To access these examples, open LabVIEW and select **Help»Find Examples» Hardware Input and Output»Controller for FlexRIO**.

For more detailed instructions about programming the NI-7935R with LabVIEW, refer to the *NI-7931R/7932R/7935R User Manual*.

Related Information

FlexRIO Documentation on page 2

Text-based Programming

You can target the NI-7935R Linux Real-Time operating system from text-based development environments such as C and C++.

Related Information

For more information about text-based programming, refer to the Getting Started with C/C++ Development Tools for NI Linux Real-Time, Eclipse Edition tutorial.

Removing the Adapter Module

Complete the following steps to remove an adapter module from the NI-7935R.

1. Disconnect all cables to the adapter module.
2. Power off the NI-7935R.[2]
3. Unscrew the adapter module.
4. Remove the adapter module.

Troubleshooting the NI-7935R

Related Information

Connecting the NI-7935R to the Host Computer on page 8

Why Can't the NI-7935R Communicate with the Network?

1. Connect cables from your device to the host computer.
   a) If you are using the USB port, use a USB cable to connect the NI-7935R USB device port to a host computer.

      The USB driver creates a virtual network interface and assigns an IP address to the NI-7935R in the format of 172.22.11.*x*.

[2] If you cannot power down the NI-7935R, use the System Configuration application programming interface (API) to disable power to the adapter module.

b) If you are using the ethernet port, use an ethernet to connect the ethernet port to the host computer.

2. In MAX, expand your system under Remote Systems.
3. Select the **Network Settings** tab to configure the IP and other network settings.
4. (Optional) Use the RJ-45 Ethernet port 1 to reconnect the NI-7935R to the host computer. The NI-7935R attempts to initiate a DHCP network connection at powerup.

   If the NI-7935R cannot contain an IP address, it connects to the network with a link-local IP address with the form 169.254.*x.x*. The host computer communicates with the NI-7935R over a standard Ethernet connection.

Why Doesn't the Device Appear in MAX?

If you cannot find the NI-7935R in MAX, complete the following steps.

- Ensure you have the correct version of FlexRIO Support installed on the host computer.
- Check the USB cable connections at the NI-7935R and host computer. Check the Ethernet cable connections at the host computer and router.
- If you have network firewalls or other security software enabled, try temporarily turning them off. You may also need to add an exception for MAX. In Windows 7, select **Start»Control Panel»System and Security»Windows Firewall»Allow a program through Windows Firewall**. Click **Allow another program**, select **Measurement & Automation**, click **Add**, then click **OK**.
- Ensure that UDP port 44525 is open to communication on the host computer. If you are using an intelligent switch on the network, ensure that it is not disabling UDP port 44525.
- Hold down the RESET button for 5 seconds to reboot the target into safe mode. This prevents a real-time app from running. Sometimes a malfunctioning real-time app prevents network communication.
- Check the Device Manager to ensure the National Instruments USBLAN adapter is recognized. In Windows 7, select **Start»Control Panel»Device Manager»Network adapters»National Instruments»USBLAN adapter**. If the USBLAN adapter is not recognized, you must reinstall FlexRIO Support.
- Ensure that the Ethernet cable is connected correctly.

Related Information

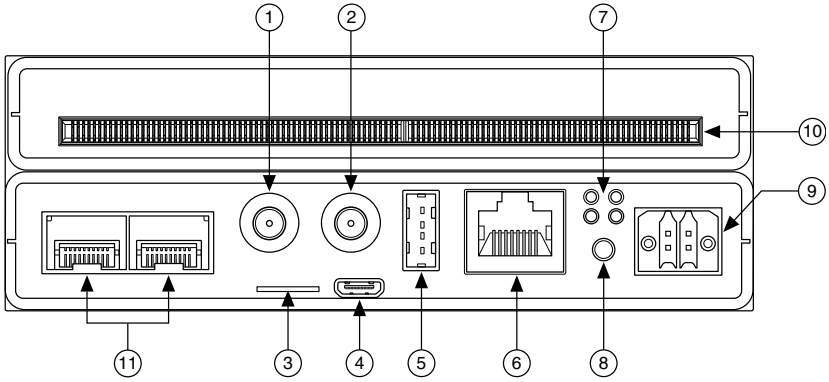
Configuring the System in Measurement & Automation Explorer (MAX) on page 9

Appendix: Front Panel

NI-7935R Front Panel

The following figure shows the NI-7935R front panel connectors, buttons, and LEDs.

Figure 3. NI-7935R



1. TRIG
2. REF CLK
3. Storage (µSD card)
4. USB device port
5. USB host
6. 1 Gigabit Ethernet
7. LED indicators
8. Reset
9. DC power source
10. FlexRIO adapter module connector
11. Port 0/Port 1 (SFP+ connectors)

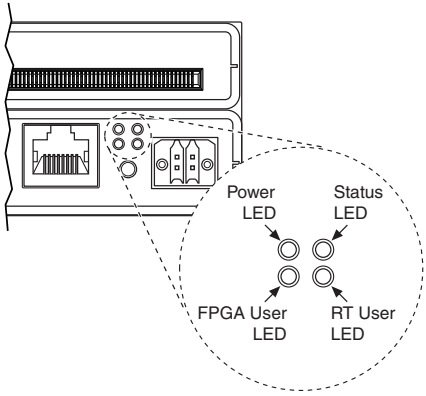
Related Information

For more information about the NI-7935R front panel connectors, buttons, and LEDs, refer to the FlexRIO Help.

LED Indicators

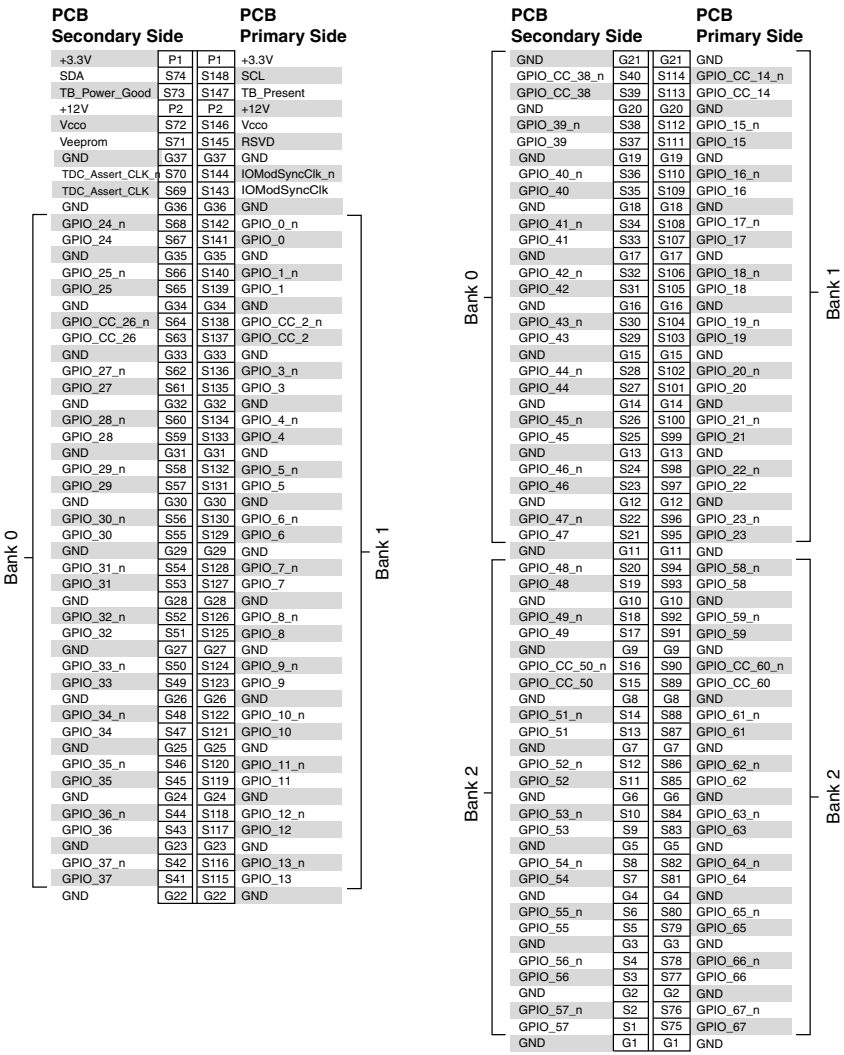
The following figure shows the NI-7935R LEDs in more detail.

Figure 4. NI-7935R LEDs



NI-7935R Module Signals

The following figure shows the available signals on the NI-7935R.



Worldwide Support and Services

The National Instruments website is your complete resource for technical support. At *ni.com/support*, you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit *ni.com/services* for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit *ni.com/register* to register your National Instruments product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting *ni.com/certification*. If your product supports calibration, you can obtain the calibration certificate for your product at *ni.com/calibration*.

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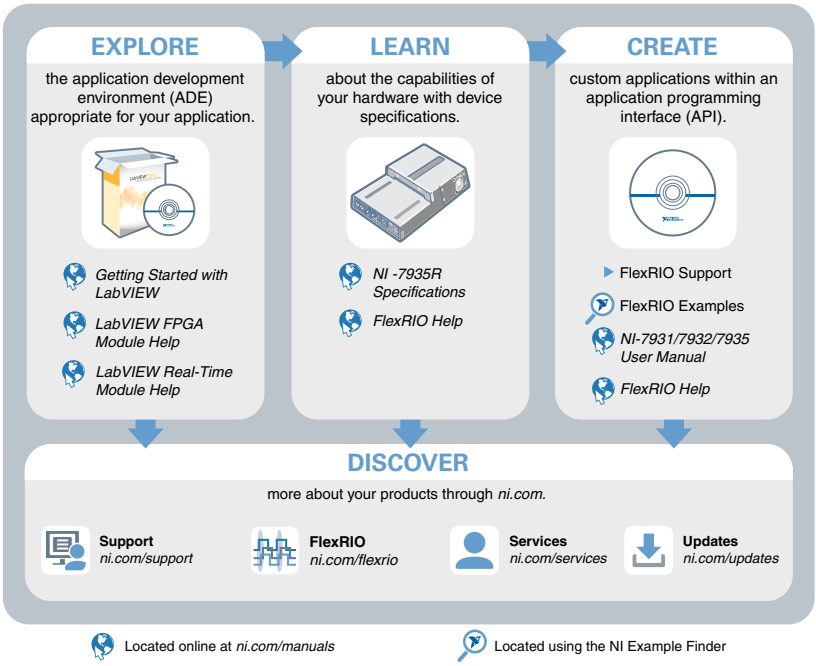
Where to Go Next

Refer to the following figure for information about other product tasks and associated resources for those tasks.


EXPLORE
the application development environment (ADE) appropriate for your application.
Getting Started with LabVIEW
LabVIEW FPGA Module Help
LabVIEW Real-Time Module Help
LEARN
about the capabilities of your hardware with device specifications.
NI -7935R Specifications
FlexRIO Help
CREATE
custom applications within an application programming interface (API).
FlexRIO Support
FlexRIO Examples
NI-7931/7932/7935 User Manual
FlexRIO Help
DISCOVER
more about your products through ni.com.
Support
ni.com/support
FlexRIO
ni.com/flexrio
Services
ni.com/services
Updates
ni.com/updates
Located online at ni.com/manuals
Located using the NI Example Finder

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